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Medicine Creek Watershed Investigations

Medicine Creek, Nebraska

Status Report No. 2

Agricultural Research Service
Soil Conservation Service
Bureau of Reclamation
Geological Survey
University of Nebraska

September 1957

United States
Department of
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MEDICINE CREEK WATERSHED INVESTIGATION

MEDICINE CREEK, NEBRASKA

STATUS REPORT NO. 2

GENERAL

Status Report No. 1

The Soil Conservation Service, Bureau of Reclamation, Geological Survey, and the University of Nebraska prepared the first status report on the investigations in November 1951. The report was reproduced by the Bureau of Reclamation and was distributed by the cooperating agencies, and copies are no longer available. Status Report No. 2 is in part repetitious in order to cover the studies more completely.

Purpose of Report

This report will summarize:

1. Events leading to the cooperative investigations.
2. Objectives of past and current studies.
3. Plans for continuing current studies.
4. Conclusions based on data collected to date.
5. Recommendations for additional studies.

Introduction

The need for watershed treatment, soil and water conservation, and works of improvement to maintain soil fertility and to reduce erosion, flood water, and sediment damages exists throughout much of the Missouri River Basin. Such treatment on watersheds approaching the size of Medicine Creek does not exist. In addition, the effect of upstream watershed treatment on downstream water supplies is a very controversial and important problem, and factual data to determine the effects were not available in this area. Therefore, in 1950 the Bureau of Reclamation, the University of Nebraska, and the Soil Conservation Service decided to initiate this cooperative investigation. At the present time the investigations are carried

on by informal agreement between the Soil Conservation Service, the Bureau of Reclamation, the Geologic Survey, the Agricultural Research Service, and the Nebraska Experiment Station.

This watershed was selected for the investigations because of its severe erosion and runoff problems, because of its size, because it is above a multipurpose reservoir, and because data collected in this area are applicable to much of the loess-mantled portion of the Missouri River Basin. Medicine Creek has a contributing drainage area of 656 square miles above Medicine Creek Dam and 687 square miles above its mouth. All but a small portion is mantled by deep loess that overlies the Ogallala formation. The small portion not mantled by loess is in the Nebraska sand dune area. A high percentage of the watershed is under cultivation. (See Exhibit 1.)

The agencies agreed that the results of the investigations should serve as a basis for answering questions relative to:

1. The type of resource development program that should be carried out to create maximum upstream and downstream benefits.
2. The benefits from such a program that will accrue to the land and to the people living in the watershed.
3. The effect of a program upon irrigation, flood control, stream water utilization, wildlife, pollution abatement, and sedimentation.
4. The degree of effectiveness of a watershed treatment program in prolonging the useful life of Harry Strunk Lake.

The activities to date have been primarily directed toward the collection of basic data relating to land classification, land use, erosion, precipitation, runoff, gully development, and sedimentation.

Summary of Prior Activities

Discussions leading to the current cooperative effort in the Medicine Creek watershed began in the spring of 1950. The first meeting between the Bureau of Reclamation and the Soil Conservation Service for specific consideration of the Medicine Creek area was held May 22, 1950, in Lincoln, Nebraska, at the request of the Bureau of Reclamation. The Bureau expressed its concern about the high sediment yield rates in the Medicine Creek watershed and requested that the Soil Conservation Service make a survey to develop a program of erosion control and soil and water conservation for the watershed. Discussion of this proposal developed these important conclusions: (1) that the Department of Agriculture had no authorized funds for making such a survey; (2) that in the opinion of

the Bureau of Reclamation, funds could be obtained for this purposes from appropriations made to the Department of the Interior for soil and moisture conservation activities; and (3) that the Soil Conservation Service would immediately prepare an estimate of the cost of such a watershed survey.

A second meeting between Bureau of Reclamation and Soil Conservation Service representatives was held in McCook, Nebraska on June 1 and 2, 1950. During this meeting a reconnaissance was made of the watershed to better enable Soil Conservation Service representatives to estimate the cost of a watershed survey.

In line with discussions and agreements at the McCook meeting, the Soil Conservation Service on June 6, 1950 transmitted to the Bureau of Reclamation a cost estimate for making the survey of watershed protection and agricultural flood control.

Early in 1951 the Bureau of Reclamation proposed and submitted for consideration the draft of a Field Working Agreement between the U.S.D.I., Bureau of Reclamation, Region 7; the U.S.D.A., Soil Conservation Service, Region 5; and the University of Nebraska which provided for participation of each agency in a cooperative survey of the Medicine Creek watershed. Consideration of this proposal again developed the fact that the Department of Agriculture had no authorized funds for making a survey of the Medicine Creek area and such an agreement was not in order.

Discussions arising from presentation of this latter proposal, however, re-emphasized the need for additional hydrologic and sedimentation data for the Medicine Creek watershed and led to the development of an informal working agreement between the Bureau of Reclamation, the Geological Survey, the University of Nebraska, and the Soil Conservation Service for collection of such information.

It was decided by the above agencies that the complete job consisted of carrying out the following steps: (1) collection of basic data, (2) a watershed survey, (3) establishment of works and measures, and (4) program evaluation.

With respect to Step 1, about six years of hydrometeorological data have been collected. A comprehensive survey network to enable the determination of channel erosion has been established on Dry Creek and its principal tributaries. (See Exhibit 2.) Stream gaging and sediment stations have been established to measure the sediment yield of two very small watersheds. Geomorphic studies were made in the Dry Creek Basin to determine the history of erosion and terrace development processes. Topographic surveys covering all of the Medicine Creek watershed have been completed. Annual land use surveys for the watershed were made in 1954, 1955, and 1956. A detailed soil conservation survey was initiated in 1951 and will be completed during 1957.

The cooperating agencies decided that in order to complete Step 1, arrangements should be made for analysis of the collected data. A Memorandum of Understanding was proposed in 1957 that provided for a

steering committee to plan and direct all future investigations. One of the most important jobs of this committee will be the planning and direction of a practical data-analysis program. This Memorandum is still unsigned.

OBJECTIVES OF BASIC DATA COLLECTION

The primary use of data from the sediment, stream gaging, and meteorological stations, together with information on land use, erosion, farming methods, and kind and amount of conservation practices and other watershed treatment measures, is to establish a "before treatment" base to aid in determination of the type of remedial program needed in the Nebraska West Loess Hills and Canyon physiographic area. By establishing and maintaining information on "before" and "after" conditions, the collected data will also be the basis for evaluating the physical effects of the treatment program. The topographic maps will serve as base maps for the development of remedial programs.

Other objectives of the current investigations are to provide:

1. A basis for determining the rate of sediment production in Medicine Creek watershed.
2. A basis for dividing the Medicine Creek watershed into subareas according to their importance as sediment sources.
3. Data on the rate of channel erosion and a basis for estimating the amount of sediment derived from the stream channel, from upland gullies, and from sheet and rill erosion in a typical tributary watershed.

The basic hydrologic, sedimentation, land use, and other data being assembled will also be extremely useful in planning and developing conservation and watershed treatment programs throughout the Nebraska West Loess Hills and Canyon physiographic area, of which the Medicine Creek watershed is a part. This larger area covers about 18,000 square miles in western Nebraska and Kansas.

SCOPE AND PRESENT STATUS OF INVESTIGATIONS

Hydrometeorological Network

The stations in the hydrometeorological network established in 1951 were continued in operation. Two stream gaging and sediment stations and two regular and one supplemental precipitation stations were added to this network. Data from the network will provide the

maximum amount of information for the stated objectives consistent with funds available for the investigations. The locations of the study areas and the precipitation, stream gaging, and sediment stations are dictated by the relative value of the data to be obtained at the various sites, the adaptability of local physical and cultural conditions, and the availability of observers.

Daily records of suspended sediment discharge and rates of streamflow have been obtained at seven representative locations in the Medicine Creek watershed since 1951. Observations of suspended sediment discharge through the outlet works and over the spillway of Medicine Creek Dam have also been made at periodic intervals since that date. To obtain information on the sediment yield from upland sheet erosion and upland gullies, two additional stream gaging and sediment stations were established in very small watersheds in 1953. The network of stations is operated by the Geological Survey. The stations are shown on the following table:

Table 1

Station	Date station established		Drainage area
	Gaging	Sediment	
Medicine Creek at Maywood	4-25-51	4-24-51	77
Medicine Creek above Reservoir	1-19-50	4- 2-51	540
Medicine Creek at Dam	1-19-50	6-20-51- 9-30-52 10- 1-53	656
Medicine Creek at Cambridge	12-10-36	3-27-51	680
Brushy Creek near Maywood	4-25-51	4-25-51	72
Fox Creek at Curtis	3-29-51	3-29-51	44
Tobiassen Draw at Tobiassen Farm near Curtis	9-16-53	9-16-53	.34
Dempsy Draw at Dempsy Pond near Moorefield	8-23-53	8-23-53	.52
Dry Creek near Curtis	3-27-51	3-29-51	23
Mitchell Creek above Reservoir	4-28-50	4- 2-51	55

The locations of the stations are shown on Exhibit 1.

Records of suspended sediment discharge are based on samples collected with standard sediment sampling equipment. During periods of significant flow, samples are collected daily by resident observers living near each of the stations or by personnel of the Geological Survey. When the water discharge and sediment concentration are changing rapidly because of flood runoff, flows are sampled as frequently as four times an hour. At selected stations, periodic bed-material samples are obtained for use in total load computations. Daily observations of water temperatures are available for five of the stations.

Streamflow and sediment-discharge measurements are made on about a weekly frequency by engineers of the Geological Survey stationed at Curtis, Nebraska; Cambridge, Nebraska; or Norton, Kansas. The stage-discharge relationship is now fairly well defined for some stations; however, because of the shifting nature of the streams, water-discharge measurements are needed for each major rise.

Data on runoff and suspended-sediment discharge are published in the series of annual water-supply papers of the Geological Survey except for the Tobiassen Draw at Tobiassen Farm near Curtis and the Dempcy Draw at Dempcy Pond near Moorefield stations. Data for these stations are on file at the Geological Survey offices, Lincoln, Nebraska.

Records of precipitation have been obtained since 1951 at 13 of the 15 stations now in operation in the watershed. In 1954, two additional standard Weather Bureau rain gages were added to the network by representatives of the Weather Bureau and the Geological Survey. In 1956 a tipping-bucket rain gage was installed on the water-stage recorder at Dempcy Pond by the Geological Survey to supplement records for the Moorefield 6 NNW station. Except for the latter gage and for the five original precipitation gages, the network is supported by a cooperative agreement between the Weather Bureau and the Bureau of Reclamation. Owing to the lack of cooperative observers and for other reasons, some of the stations have been moved one or more times. Precipitation data for these 15 stations are on file at the Weather Bureau office, Lincoln, Nebraska. Precipitation data for the tipping-bucket rain gage are on file at the Geological Survey office, Lincoln, Nebraska.

The locations of precipitation stations as of July 1, 1956, are shown on Exhibit 1 and Table 2.

Sedimentation Studies

The sedimentation studies are providing information on:
(1) the sediment yield of Medicine Creek watershed and selected sub-watersheds, (2) the sources of sediment with respect to tributaries

PRECIPITATION STATION LOCATIONS

	Station	Location	Period of Record	Type Gage	Observer
1.	a. Stockville 5 SSW b. Stockville 5 S	NE $\frac{1}{4}$, 29, 6 N, 27 W NW $\frac{1}{4}$, 26, 6 N, 27 W	4- 9-51 - 2-10-52 2-11-52 -	Recording Recording	E. E. Ramsey L. A. Owens
2.	a. Stockville 6 NE b. Stockville 6 NNE c. Moorefield 6 SE d. Moorefield 6 SE	SE $\frac{1}{4}$, 6, 7 N, 26 W SW $\frac{1}{4}$, 35, 8 N, 27 W SW $\frac{1}{4}$, 30, 8 N, 26 W SW $\frac{1}{4}$, 30, 8 N, 26 W	4-11-51 - 2-11-52 2-12-52 - 8-17-54 2-18-54 - 4-11-56 4-12-56 -	Non-recording Non-recording Non-recording Non-recording	L. G. Koch K. C. White W. G. Palmer Mildred Widick
3.	Maywood 7 WSW	NW $\frac{1}{4}$, 28, 8 N, 30 W	5- 1-51 -	Non-recording	M. H. Christensen
4.	Wellfleet 8 NE	SW $\frac{1}{4}$, 8, 10N, 29 W	4-10-51 -	Non-recording	H. T. Detour
5.	a. Curtis 5 SW b. Curtis 5 SSW	SW $\frac{1}{4}$, 13, 7 N, 29 W NE $\frac{1}{2}$, 24, 7 N, 29 W	4- 9-51 - 10-27-54 10-28-54 -	Non-recording Non-recording	H. L. Johnston Bessie M. Cole
6.	a. Moorefield 3 NNW b. Moorefield 3 NW	NE $\frac{1}{4}$, 31, 9 N, 27 W SE $\frac{1}{4}$, 20, 9 N, 27 W	4-12-51 - 12- 6-51 12- 7-51 -	Recording Recording	R. H. Martens C. H. Nelson
7.	Curtis 14 N	SW $\frac{1}{4}$, 16, 10N, 28 W	4-12-51 -	Non-recording	Ralph Gutherless
8.	Medicine Creek Dam	NW $\frac{1}{4}$, 25, 5 N, 26 W	10- 1-51 -	Non-recording	U.S.B.R.
9.	Curtis 4 N	SE $\frac{1}{4}$, 4, 8 N, 28 W	2- 9-54 -	Recording	R. F. Piest
10.	Moorefield 6 NNW	NE $\frac{1}{4}$, 6, 9 N, 27 W	2- 9-54	Recording	J. N. Dempcy
11.	Moorefield	SE $\frac{1}{4}$, 5, 8 N, 27 W	7-16-47 -	Non-recording	A. M. Mercer
12.	Cambridge	SW $\frac{1}{4}$, 29, 4 N, 25 W	7- 1-48 -	Non-recording	R. L. McKinney
13.	Stockville	NE $\frac{1}{2}$, 33, 7 N, 27 W	7- -47 -	Non-recording	M. R. Johnson
14.	Wellfleet	NW $\frac{1}{2}$, 15, 9 N, 30 W	7-16-47 -	Non-recording	C. S. Olson
15.	Curtis	SE $\frac{1}{4}$, 28, 8 N, 28 W	1- 1-53 -	Recording	E. L. Crawford

entering Medicine Creek above the reservoir, (3) the relationship of erosion in the Dry Creek Basin to the suspended-sediment discharge, and (4) the relationship of erosional geomorphology to hydraulics and hydrology.

The physiographic study of the Dry Creek channel system described in Status Report No. 1 was continued. In June 1952 all items were resurveyed and a preliminary estimate of channel enlargement between May 1951 and June 1952 was made by personnel of the Bureau of Reclamation. Representatives of the cooperating agencies recognized that resurveys should be spaced, timewise, according to criteria based on runoff; however, as a result of field reconnaissance five additional new items were surveyed by the Bureau of Reclamation in 1953. Additional new items were also surveyed by the Bureau in 1954 and 1956 to cover advancing headcuts. The location and scope of these surveyed items and information on all previous surveys are shown on Exhibits 2 and 3.

In June 1953, sixty-two undisturbed soil samples from the terraces, gullies, and the main stream channel of Dry Creek were collected by personnel of the Geological Survey and the Bureau of Reclamation for specific weight and particle-size analyses. These data will be used to convert measured volumes of erosion to weights for comparison with the measured suspended-sediment discharge and to convert measured weights of sediment loads to volumes of sediment in place. Field survey data, plotted cross sections of items surveyed, computations of volumetric changes in Dry Creek channel, and the results of analyses of soil samples are on file in the Kansas River Project office of the Bureau of Reclamation. Representatives of the cooperating agencies recognized the need for information on the sediment yield from upland sheet and upland gully erosion to assist in studies of relative erosion and deposition in the Dry Creek watershed. After a field reconnaissance of small watersheds in and near Dry Creek Basin on June 1-5, 1953, two typical areas were selected for the study--the Tobiassen Farm and the Dempcy Pond drainage areas.

The Tobiassen Farm is located in Section 4, T. 8 N., R. 28 W., about 4.5 miles north of Curtis. This watershed, on a tributary to Medicine Creek, has a drainage area of .34 square miles. It is entirely cultivated and more than half of the area is terraced. The soil is Holdrege silt loam and the area is farmed under a rotation of wheat and fallow. A stream gaging and sediment station was established at the county road culvert draining the area.

The Dempcy retention pond is located in Section 6, T. 9 N., R. 27 W., on a tributary of Curtis Creek and is about 1 1/4 miles north of Curtis. Soils in the .52 square mile drainage area have been classified as the broken phase of Colby very fine, sandy loam. Practically all of the watershed is in grass and is used for cattle range, with probably not more than 10 percent of the area under cultivation. This 10 percent is along the divides. Exhibit 4 shows a general view of the

area tributary to Dempcy Pond. This stockwater reservoir was built in 1948 and has ample storage capacity for the size of the drainage area. It spilled in 1951 and again in July 1956. Permanent range ends have been established to facilitate future sedimentation surveys. A sedimentation survey of this pond was made jointly by the Geological Survey and the Soil Conservation Service during July 1953. Results of this survey are shown on the attached Reservoir Sedimentation Data Summary Sheet. (See Exhibit 5.) Area and capacity curves, a contour map, and a map showing sediment deposit depths and other basic survey data are in the Geological Survey office, Lincoln, Nebraska.

Harry Strunk Lake was formed by the construction of Medicine Creek Dam. It is located on Medicine Creek approximately two miles west and seven miles north of Cambridge, Nebraska. The dam was completed in 1949 by the Bureau of Reclamation and the reservoir had an original total capacity of approximately 92,340 acre-feet to the top of the flood storage pool. The dam was constructed to provide for the storage of water for irrigation, for flood control, and for sediment retention. The contributing drainage area is 656 square miles.

A sedimentation survey of Harry Strunk Lake was made by the Bureau of Reclamation during September and October 1951, using echo sounding equipment. Detailed information concerning this survey and the results obtained can be found in the September 1952 report by the Bureau of Reclamation. A summary of the results of this survey is shown on the Reservoir Sedimentation Data Summary Sheet. (See Exhibit 6.) The original detailed survey notebooks and other data are available in the Bureau of Reclamation office at McCook, Nebraska.

Geomorphic Studies

In 1953 and 1954 geomorphic studies were made primarily on the rapidly changing topographic features in Dry Creek Basin, such as headcuts, gullies, and terracettes. These studies utilized information from field observations and measurements, aerial photographs, radio carbon datings, and stratigraphic relations. They provide: (1) quantitative data on upland gully erosion between 1935 and 1952, (2) information on the significance of terracettes in erosion and in sediment yields, (3) information on the physiographic history of Dry Creek as developed from an analysis of the complex terrace sequence, and (4) the historic and recent behavior of channel headcuts. In addition, reconnaissance-type data were obtained on the terrace sequence along Medicine Creek from the confluence of Dry Creek to the Lime Creek locality. Wells Canyon, a tributary without headcuts, was studied and compared with Dry Creek, a tributary with several major headcuts. The results of these studies were released in 1955 by the Geological Survey in the open file report "Geomorphology of Dry Creek drainage basin, Nebraska" by J. C. Brice.

Data were obtained in 1956 for: (1) determining drainage areas of upland gullies and minor tributaries, (2) analyzing quantitatively geomorphic landform and drainage density, (3) relating measured stream gradients and longitudinal and transverse profiles of terraces along Medicine Creek and selected tributaries with changes in regimen, (4) preparing an areal map of the terraces, and (5) correlating these terraces by elevation and by stratigraphy. In addition, petrologic studies made at selected sites provide information on the structural and textural properties of the loess mantle.

Data for the 1956 studies are on file in the Lincoln, Nebraska office of the Geological Survey. The results of the studies will be published.

Conservation Surveys

The Soil Conservation Service is engaged in making a detailed soil conservation survey of the Medicine Creek watershed. The work is progressing satisfactorily and the survey will likely be completed during 1957. This survey delineates homogeneous areas of soil, slope, erosion, and land use in the watershed. Its objective is to provide physical land facts that help determine proper land use. It will also serve the purpose of furnishing soils and related information to the various soil conservation districts in the area for planning and establishing soil and moisture conservation practices on individual farms. A detailed conservation survey of the Dry Creek subwatershed was completed during the summer of 1951. This survey information is on record in the four Soil Conservation Service work unit offices in McCook, Curtis, Palisade, and North Platte, Nebraska.

Land Use Surveys

The Soil Conservation Service and the Agricultural Research Service cooperated in making an annual land use survey of the entire Medicine Creek Basin in 1954, 1955, and 1956. The Soil Conservation Service furnished a set of 215 aerial photographs of the basin, taken in 1951 and 1952, and provides an airplane and pilot for this work. The Agricultural Research Service furnishes an observer for mapping, makes area measurements, and tabulates the results of the survey.

Prior to the field work, the photographs--scale 1" = 1320 feet--were arranged in flight lines across the drainage basin, were numbered consecutively, and the portion of the watershed to be mapped on each picture was blocked-out. In the field operation, the plane follows the flight lines and circles each pictured area long enough to permit visual delineation of all field boundaries and the recording of land use by a symbol, in accordance with the following list:

<u>Land use category</u>	<u>Symbol</u>
Row crops	R
Small grain	W
Fallow	F
Hay	A
Pasture or range	P
Farmsteads	H
Streams and lakes	C
Trees	T

For purposes of tabulation and summarization of the land use survey records, the Medicine Creek Basin was divided into 15 watershed units. These subdivisions are shown on Exhibit 7. Watershed Unit A includes all of the drainage area above the stream gage at Cambridge. Subwatershed B includes all of the drainage area above the Medicine Creek Dam. Subwatershed C is limited to Mitchell Creek and includes all of the drainage area above the gage and sediment station on that stream. Subwatershed D includes all of the drainage area of Medicine Creek above the gage at the head of the lake. The other subwatersheds consist of the drainage area of the principal tributaries of the Medicine Creek Basin, including a separation for each of the watersheds where runoff and sediment records are being obtained.

Land use for crop year 1954 in the Medicine Creek Basin is summarized in Table 3. This tabulation gives the acreage of each land use category by subwatersheds. Table 4 shows the percentage that each land use category is of the total area of the subwatershed. Table 5 gives the land use summary for crop year 1955 by showing a tabulation of the acreage of each land use category by subwatersheds. Table 6 shows the percentage that each land use category is of the total area of the subwatershed for crop year 1955. Land use for crop year 1956 is in the process of being summarized but these tabulations are not now available.

Detailed data of the land use for crop years 1954, 1955, and 1956 are available in the Agricultural Research Service office in Lincoln, Nebraska.

A land use inventory has also been made of the Dry Creek subwatershed for crop years 1951 and 1952. These are shown on aerial mosaics and are located in the Agricultural Research Service office in Lincoln, Nebraska.

A range condition survey of the Dry Creek subwatershed was also made in 1952 by the Soil Conservation Service. The results of this work are available in the Agricultural Research Office in Lincoln, Nebraska.

MEDICINE CREEK WATERSHED - 1954 Land Use--Summary - Acreages

Sub-watershed	R	W	F	A	P	Sub-Total	H	Roads	C	Trees	Total
A	53,927	27,339	37,151	23,972	288,872	431,261	1,971	5,293	4,020	274	442,819
B	49,491	25,580	35,421	22,634	278,254	411,380	1,741	4,987	3,824	274	422,206
C	7,642	3,727	4,057	1,369	15,932	32,727	217	453		6	33,403
D	36,519	18,653	28,098	19,471	241,916	344,657	1,449	4,073	694	243	351,116
E	1,099	458	1,113	114	4,088	6,872	29	78			6,979
F	6,069	3,286	4,840	1,035	21,750	36,980	194	488		36	37,698
G	2,451	989	2,373	668	8,195	14,676	66	122		1	14,865
H	2,019	1,324	1,653	435	4,989	10,420	72	163		14	10,669
I	1,567	1,128	1,044	386	8,770	12,895	30	161	5		13,091
J	3,070	1,157	1,864	1,066	18,295	25,452	42	268			25,762
K	2,704	1,176	1,934	1,357	38,814	45,985	78	421			46,484
L	2,494	886	1,825	1,314	28,198	34,717	63	261		1	35,042
M	1,519	1,100	2,049	756	11,970	17,394	42	166			17,602
N	3,125	2,271	4,067	3,571	33,617	46,651	85	458		4	47,198
O	2,872	1,152	1,851	5,961	34,357	46,193	263	777	80	149	47,462
Total	176,568	90,226	129,340	84,109	1,038,017	1,518,260	6,342	18,169	8,623	1,002	1,552,396

MEDICINE CREEK WATERSHED - 1954 Land Use--Summary - Percentages

Sub-watershed	R	W	F	A	P	Sub-total	H	Roads	C	T	Total
A	12.18	6.17	8.39	5.41	65.23	97.38	0.45	1.20	0.91	0.06	100.00
B	11.72	6.06	8.39	5.36	65.91	97.44	0.41	1.18	0.91	0.06	100.00
C	22.88	11.16	12.14	4.10	47.70	97.98	0.64	1.36		0.02	100.00
D	10.40	5.31	8.00	5.55	68.90	98.16	0.41	1.16	0.20	0.07	100.00
E	15.75	6.56	15.95	1.63	58.58	98.47	0.41	1.12			100.00
F	16.10	8.72	12.84	2.74	57.70	98.10	0.51	1.29		0.10	100.00
G	16.49	6.66	15.96	4.49	55.13	98.73	0.44	0.82		0.01	100.00
H	18.92	12.41	15.49	4.08	46.77	97.67	0.67	1.53		0.13	100.00
I	11.97	8.61	7.97	2.95	67.00	98.50	0.23	1.23	0.04		100.00
J	11.92	4.49	7.24	4.14	71.01	98.80	0.16	1.04			100.00
K	5.82	2.53	4.16	2.92	83.50	98.93	0.17	0.90			100.00
L	7.12	2.53	5.21	3.75	80.47	99.08	0.18	0.74			100.00
M	8.63	6.25	11.64	4.30	68.00	98.82	0.24	0.94			100.00
N	6.62	4.81	8.62	7.57	71.22	98.84	0.18	0.97		0.01	100.00
O	6.05	2.43	3.90	12.56	72.39	97.33	0.55	1.64	0.17	0.31	100.00
Total											

MEDICINE CREEK WATERSHED - 1955 Land Use - Summary - Acreages

Sub-watershed	R	W	F	A	P	Sub-total	H	Roads	C	T	Total
A	47,616	33,722	39,638	20,897	287,819	429,692	3,561	5,293	3,965	308	442,819
B	43,949	31,806	37,021	19,493	277,488	409,757	3,319	4,987	3,835	308	422,206
C	6,659	4,192	4,626	1,433	15,766	32,676	270	453		4	33,403
D	32,286	24,443	28,574	16,103	241,741	343,147	2,966	4,073	634	296	351,116
E	906	895	855	175	4,043	6,874	27	78			6,979
F	5,352	4,020	4,863	1,068	21,726	37,029	142	488		39	37,698
G	2,643	1,760	1,823	420	8,025	14,671	70	122		2	14,865
H	1,526	1,901	1,600	430	4,968	10,425	72	163		9	10,669
I	1,593	1,007	1,156	375	8,759	12,890	44	157			13,091
J	2,229	1,663	2,015	980	18,558	25,445	50	267			25,762
K	2,113	1,685	2,046	1,388	38,744	45,976	88	420			46,484
L	2,099	1,750	1,646	1,106	28,081	34,682	59	261	38	2	35,042
M	1,641	1,426	1,824	658	11,844	17,393	43	166			17,602
N	2,453	3,209	4,326	3,052	33,611	46,651	85	458		4	47,198
O	2,578	1,802	1,928	3,659	36,181	46,148	282	783	78	171	47,462
Total	155,643	115,281	133,941	71,237	1,037,354	1,513,456	11,078	18,169	8,550	1,143	1,552,396

MEDICINE CREEK WATERSHED - 1955 Land Use - Summary - Percentages

Sub-watershed	R	W	F	A	P	Sub-total	H	Roads	C	T	Total
A	10.75	7.61	8.95	4.72	65.00	97.03	0.80	1.20	0.90	0.07	100.00
B	10.41	7.53	8.77	4.62	65.72	97.05	0.79	1.18	0.91	0.07	100.00
C	19.94	12.55	13.85	4.29	47.20	97.83	0.81	1.35		0.01	100.00
D	9.20	6.96	8.14	4.59	68.85	97.74	0.84	1.16	0.13	0.08	100.00
E	12.98	12.82	12.25	2.51	57.93	98.49	0.39	1.12			100.00
F	14.20	10.66	12.90	2.83	57.63	98.22	0.38	1.30		0.10	100.00
G	17.73	11.84	12.26	2.83	53.99	98.70	0.47	0.82		0.01	100.00
H	14.30	17.82	15.00	4.03	46.56	97.71	0.68	1.53		0.08	100.00
I	12.17	7.69	8.83	2.86	66.91	98.46	0.34	1.20			100.00
J	8.65	6.46	7.82	3.80	72.04	98.77	0.19	1.04			100.00
K	4.55	3.62	4.40	2.99	83.35	98.91	0.19	0.90			100.00
L	5.99	4.99	4.70	3.16	80.13	98.97	0.17	0.74	0.11	0.01	100.00
M	9.32	8.10	10.36	3.74	67.29	98.81	0.25	0.94			100.00
N	5.20	6.80	9.16	6.47	71.21	98.84	0.18	0.97		0.01	100.00
O	5.43	3.80	4.06	7.71	76.23	97.23	0.60	1.65	0.16	0.36	100.00
Total											

Land Use Surveys and Conservation Practices Tabulation

It is important that an annual inventory of land use and established conservation practices in watersheds above the sediment and runoff measurement stations be maintained. This is necessary so that adequate information may be available for correlating observed rates of runoff and sediment yield with related casual factors.

The annual increment of applied conservation practices has been recorded in the four Soil Conservation Service work unit offices operating within the watershed area. This information is, however, included in the over-all progress records of each of the work units and must be extracted and compiled in order to be useful for the purposes of this investigation. It is necessary that this information be compiled by subwatersheds above gaged points by annual increments. Range condition information should also be recorded annually.

It is currently planned that the land use, applied conservation practices, range condition classes, and soil information data will be tabulated by fields as delineated on the aerial photographs used to record the land use for each subwatershed. This tabulation will be located in the Agricultural Research Service office in Lincoln, Nebraska.

Topographic Surveys

Field work for topographic maps of the Medicine Creek Basin was completed by the Geological Survey in 1955. Advance prints of maps with 10-foot contour intervals covering the Basin were made available during 1956. The final prints will be published as indicated below:

<u>Quadrangle</u>	<u>Contour Interval</u>
Maywood 1 NE, SE, SW, NW	20
Maywood 2 SE, SW	10
Maywood 3 NE	20
Maywood 4 NE, SE, SW, NW	20
Gothenburg 2 SW	20
Gothenburg 3 NE, NW	20
Gothenburg 3 SE, SW	10
McCook 1 NE, NW	10
Bartley 1 SW, NW	10
Bartley 2 NE, SE NW	10

RECOMMENDED FUTURE INVESTIGATIONS

Continuation of Current Investigations

Hydrometeorological Network

It is recommended that the operation of the precipitation, gaging, and sediment stations be continued during the entire period of the watershed investigation. It is recommended that these data be tabulated and published in presently established series of reports or in special reports.

Sedimentation Studies

It is recommended that:

1. The present investigations of total sediment yield and of sediment sources be continued in the Dry Creek sub-watershed. It is important that the channel cross-sections be resurveyed periodically to record changes. Comparisons of these cross-sections, plus such supplemental surveying as may be required, will provide the basis for estimating the proportion of total sediment load derived from channel erosion. The frequency of rerunning the cross-sections or the interval between channel resurveys should not be determined arbitrarily. The need for resurveys will depend upon the frequency and magnitude of high runoff events. Guiding principles for resurveys are along the following lines, with resurveys to be made:

- (a) at least annually, preferably in the fall months following a year of normal runoff; or
- (b) following a series of unusually high runoff events, or
- (c) following a single runoff event of record or near record magnitude.

Following a year of minimum runoff or one in which rates of runoff are extremely low it may not be necessary to make a resurvey. It is estimated that a resurvey will require from a month to five weeks for a 4-man party--equivalent to about 110 man days of work. The resurvey should consist of a rerun of the cross sections and topography in sufficient detail to identify channel changes.

2. The present channel and gully studies in Dry Creek Basin be reviewed annually and additions or changes in the survey items be incorporated.

3. A sedimentation survey of Harry Strunk Lake and Dempcy Pond be made whenever necessary.

4. The studies of upland sheet and gully erosion in selected areas of Medicine Creek Basin be continued.

5. Current petrologic and geomorphic studies dealing with rapidly changing topographic features in Dry Creek and other sub-basins be continued.

6. Additional representative samples of soils be obtained for bulk density determinations and particle-size analyses.

Conservation Surveys

It is recommended that a detailed conservation survey of Medicine Creek watershed be continued to completion.

Land Use Surveys

It is recommended that the annual land use surveys of Medicine Creek watershed be continued.

Recommended Additional Investigations

Watershed Surveys

It is recommended that a detailed watershed survey of Medicine Creek be made by the Soil Conservation Service. Under present legislative authority--the Watershed Protection Act PL 566 and PL 1018--a request for a watershed survey and work plan must come from the people within the watershed. Such a request must be submitted to the Governor's Advisory Committee. Upon approval by this committee, the request is then forwarded to the Administrator of the Soil Conservation Service for authority to proceed with the preparation of a watershed work plan. Such a plan will describe the watershed and its problems and set forth a general plan; a schedule of operations; the estimated cost, proposed cost-sharing arrangements, and other responsibilities of those participating in the project; and economic justification for installing, operating, and maintaining those measures needed for the protection and improvement of the watershed. Such a survey will be made by the Soil Conservation Service when requested by the people in the watershed and approved as outlined above.

Land Use and Conservation Practices Tabulation

It is recommended that land use and applied conservation practices be tabulated by fields on an annual basis.

Sedimentation Studies

The sediment source studies in Dry Creek subwatershed should be intensified. An excellent base has been established through the engineering surveys for observing the rates of change in and sediment yield of the primary stream system of Dry Creek. Although some measurements have been made on upland gullies, a completely satisfactory basis for estimating sediment yield from upland gully and sheet erosion has not been established. It is obvious that these other two erosion processes may constitute important sources of sediment. It is recommended that a complete sediment source study be made in a subbasin where the physical characteristics differ from those of Dry Creek.

It is recommended that additional information on the rate of sediment yield from sheet and rill erosion be obtained by means of sedimentation surveys on stock ponds and additional periodic sediment measurements on small watersheds. Much valuable data on rates of sediment yield from small watersheds, including comparisons of rates from watersheds of different land uses, types of farming, conservation practices, etc., have been obtained for other areas in this manner.

Range Condition Survey

In order to correlate properly the amount of runoff and erosion from range areas with runoff and sediment data, it is necessary to know the condition of the surface cover. It is recommended that a range condition survey be made and an annual check be taken to determine the changes in extent and condition of the range cover.



MEDICINE CREEK BASIN

HYDROMETEOROLOGICAL NETWORK



SURVEY ITEMS

- ① Station 49,000 feet-Head Cut.
- ②-1 Station 50,650 feet-Cross Sec.
- ②-2 Station 51,660 feet-Cross Sec.
- ②-3 Station 53,540 feet-Cross Sec.
- ②-4 Station 55,355 feet-Cross Sec.
- ③ Station 2,840 feet-Head Cut
- ④-1 Station 5,000 feet-Cross Sec.
- ④-2 Station 5,930 feet-Cross Sec.
- ⑤ Station 1,823 feet-Head Cut
- ⑥-1 Station 4,300 feet-Cross Sec.
- ⑥-2 Station 4,230 feet-Cross Sec.
- ⑦ Station 17,920 to 18,520-Reach
- ⑧-a Station 24,165 to 24,765-Reach
- ⑧-b Station 30,180 to 30,780-Reach
- ⑧-c Station 35,065 to 35,665-Reach
- ⑧-d Station 38,400 to 39,000-Reach
- ⑧-e Station 43,610 to 44,210-Reach
- ⑨-1 Profile Medicine Creek to 59,045 ft.
- ⑨-2 Profile East Fork Dry Cr. to 16,020 ft.
- ⑩ Station 1,870 feet-Head Cut
- ⑪-a Station 670 feet-Headcut
- ⑪-b Station 44,950 to 46,150-Reach
- ⑩-a Station 300 feet-Cross Sec.
- ⑩-b Station 1,000 feet-Head Cut

Station distances are measured from mouth of main channel or tributary.

LOCATION MAP DRY CREEK CHANNEL EROSION SURVEY

Note:

Items 3a, 8f and 10a established in 1953, Item 10b in 1956, and remaining Items in 1951.

Dry Creek Channel
Erosion Survey Data

Item No.	Item Station ^{a/} (Ft.)			Cross Sectional Intervals (Ft.)	Survey Dates		Location Description
	From (Downstream)	To (Upstream)	Primary Cross Section		Original	Subsequent	
1	47,830	49,830	48,830	50	June 4-13, 1951	May 2-12, 1952 Mar. 19-23, 1956	Main Channel, S. 29, T 9 N, R 27 W
2-1			50,650		May 16, 1951	Apr. 29, 1952	Main Channel, S. 29, T 9 N, R 27 W
2-2			51,660		May 16, 1951	Apr. 29, 1952	Main Channel, S. 20, T 9 N, R 27 W
2-3			53,540		May 28, 1951	Apr. 28, 1952	Main Channel, S. 20, T 9 N, R 27 W
2-4			55,355		May 28, 1951	Apr. 25, 1952	Main Channel, S. 20, T 9 N, R 27 W
3	1,840	3,840	2,840	50	June 4-13, 1951	May 26-June 6, 1952 Mar. 26-Apr. 17, 1956	East Fork, S. 32, T 9 N, R 27 W
3-A	400	1,000	700	100	Dec. 2, 1953 - Jan. 21, 22, 1954	Apr. 18-19, 1956	East Fork, S. 32, T 9 N, R 27 W
4-1			5,000		May 18, 1951	May 21, 1952	East Fork, S. 32, T 9 N, R 27 W
4-2			5,930		May 21, 1951	May 21, 1952	East Fork, S. 29, T 9 N, R 27 W
5	823	2,823	1,823	50	June , 1951	June 10-16, 1952 Apr. 24-26, 1956	East Branch, S. 6, T 8 N, R 27 W
6-1			4,300	50	May 22, 1951	June 3, 1952	East Branch, S. 5, T 8 N, R 27 W
6-2			4,230		May 22, 1951	June 3, 1952	East Branch, S. 6, T 8 N, R 27 W
7	17,920	18,520	18,220	50	May 22, 1951	May 22, 1952	Main Channel, S. 24, T 8 N, R 28 W
8-A	24,165	24,765	24,465	50	May 23, 1951	June 6 & 9, 1952	Main Channel, S. 13, T 8 N, R 28 W
8-B	30,180	30,780	30,480	50	May 24, 1951	Apr. 23, 1952	Main Channel, S. 7, T 8 N, R 27 W
8-C	35,065	35,665	35,365	50	May 29, 1951	June 4-5, 1952	Main Channel, S. 6, T 8 N, R 27 W
8-D	38,400	39,000	38,700	50	May 25, 1951	May 20, 1952	Main Channel, S. 6, T 8 N, R 27 W
8-E	43,610	44,210	43,910	50	May 28, 1951	May 14-15, 1952	Main Channel, S. 32, T 9 N, R 27 W
8-F	44,950	46,150	45,150	50	Nov. 16-25, 1953	-	Main Channel, S. 32, T 9 N, R 27 W
9-1			59,045		May 28, 1951	Apr. 25, 1952	Main Channel, S. 17, T 9 N, R 27 W
9-2			16,020		May 28, 1951	May 21, 1952	East Fork, S. 21, T 9 N, R 27 W
10	1,370 <u>b/</u>	1,970 <u>b/</u>	1,870	100	May 22, 1951	June , 1952 Nov. 30, 1953 <u>b/</u>	West Branch, S. 6, T 8 N, R 27 W
10-A	216		316	100 <u>d/</u>	Dec. 1, 1953	-	West Branch, S. 6, T 8 N, R 27 W
10-B	575 <u>c/</u>	1,175 <u>c/</u>	925 <u>c/</u>	50	May 1-3, 1956	-	West Fork of S. 1, T 8 N, R 28 W West Branch

a/ Station distances are measured from mouth of Dry Creek or tributary.

b/ Cross Sections U.S. and D.S. were established in 1953
500' D.S. and 100' U.S. at 100' intervals.

c/ Approximate.

d/ Upstream only.



BRUCE DEMPCY POND WATERSHED

This 0.52 square mile drainage area is mostly in grass with only a few small areas of cultivated land located in the headwaters of the watershed.

RESERVOIR SEDIMENTATION
DATA SUMMARY

Bruce Dempcy Pond

NAME OF RESERVOIR

33-

DATA SHEET NO.

DAM	1. OWNER Bruce Dempcy			2. RIVER Tributary Curtis		3. STATE Nebraska			
	4. SEC. 6 TWP. 9N RANGE 27W			5. NEAREST TOWN Moorefield		6. COUNTY Lincoln			
	7. STREAM BED ELEV. 91 1/			8. TOP OF DAM ELEV. 104.5		9. SPILLWAY CREST ELEV. 100			
RESERVOIR	10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. SURFACE AREA ACRES	13. STORAGE ACRE- FEET	14. ACCUMULATED ACRE- FEET	15. DATE STORAGE BEGAN			
	a. FLOOD CONTROL					June 1949			
	b. POWER								
	c. WATER SUPPLY	100	2.87	12.7	12.7	16. DATE NORMAL OPER. BEGAN			
	d. IRRIGATION					June 1949			
	e. CONSERVATION								
	f. INACTIVE								
WATERSHED	17. LENGTH OF RESERVOIR 0.156 2/			MILES	AV. WIDTH OF RESERVOIR 0.042			MILES	
	18. TOTAL DRAINAGE AREA 0.52*			SQ. MI.	22. MEAN ANNUAL PRECIPITATION --			INCHES	
	19. NET SEDIMENT CONTRIBUTING AREA 0.51*			SQ. MI.	23. MEAN ANNUAL RUNOFF --			INCHES	
	20. LENGTH		MILES	AV. WIDTH		MILES	24. MEAN ANNUAL RUNOFF --		AC.-FT.
	21. MAX. ELEV.		MIN. ELEV. 91		25. CLIMATIC CLASSIFICATION Semi-arid				
SURVEY DATA	26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA ACRES	32. CAPACITY ACRE- FEET	33. C/W RATIO AC.-FT. PER SQ. MI.	
	June 1949	0	0	--	--	2.87	12.7	24	
	July 22-28, 1953	4	4	Range and contour, Detailed	13 ranges, 1 foot contours	2.87	11.8	23	
	26. DATE OF SURVEY	34. PERIOD ANNUAL PRECIPITATION	35. PERIOD WATER INFLOW ACRE- FEET			36. WATER INFL. TO DATE AC.-FT.			
			a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE		
	July 22-28, 1953								
	26. DATE OF SURVEY	37. PERIOD SEDIMENT DEPOSITS ACRE- FEET			38. TOTAL SED. DEPOSITS TO DATE ACRE- FEET.				
		a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.-YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.-YEAR		
	July 22-28, 1953	.90	.225	.36	90	.225	.36		
	26. DATE OF SURVEY	39. AV. DRY WGT. LBS. PER CU. FT.	40. SED. DEP. TONS PER SQ. MI.-YR.		41. STORAGE LOSS PCT.		42. SED. INFLOW PPM		
		a. PERIOD	b. TOTAL TO DATE	a. AV. ANNUAL	b. TOT. TO DATE	a. PERIOD	b. TOT. TO DATE		
July 22-28, 1953				1.8	7.1				

26. DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET ABOVE, AND BELOW, CREST ELEVATION														
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION														
	Note: Sediment deposits computed by planimetering a contour map of depth of deposits.														
26. DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
	0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
	PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														
45. RANGE IN RESERVOIR OPERATION															
WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW AC.-FT.								
46. ELEVATION-AREA-CAPACITY DATA															
ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY							
88.5	0	0	95	25,375	1.6	102	158,925	18.8							
89	2,000	.02	96	47,700	2.7	103	176,150	22.6							
90	3,225	.1	97	73,150	4.4	104	197,500	27.4							
91	4,575	.2	98	90,550	6.5										
92	6,650	.4	99	108,975	9.0										
93	12,350	.6	100	125,325	11.8										
94	16,925	1.0	101	143,550	15.1										
47. REMARKS AND REFERENCES 1/ Assumed datum; spillway crest = 100. 2/ Left arm. Right arm is 0.142 mi. Pond surveyed cooperatively by Soil Conservation Service and Geological Survey for the cooperating agencies, Medicine Creek watershed investigations.															
48. AGENCY SUPPLYING DATA U. S. Geological Survey					49. DATE Dec. 10, 1953										

RESERVOIR SEDIMENTATION Harry Strunk Lake (Medicine Creek Dam)
DATA SUMMARY

NAME OF RESERVOIR

33-2

DATA SHEET NO.

DAM	1. OWNER <u>Bureau of Reclamation</u>			2. RIVER <u>Medicine Creek</u>			3. STATE <u>Nebraska</u>		
	4. SEC. - <u>TWP. 5-6 N RANGE 25-26W</u>			5. NEAREST TOWN <u>Cambridge</u>			6. COUNTY <u>Frontier</u>		
	7. STREAM BED ELEV. <u>2300</u>			8. TOP OF DAM ELEV. <u>2415</u>			9. SPILLWAY CREST ELEV. <u>2386.21</u>		
RESERVOIR	10. STORAGE ALLOCATION	11. ELEVATION TOP OF POOL	12. SURFACE AREA ACRES	13. STORAGE ACRE- FEET	14. ACCUMULATED ACRE- FEET	15. DATE STORAGE BEGAN			
	a. FLOOD CONTROL	<u>2386.2</u>	<u>3470</u>	<u>52,270</u>	<u>92,340</u>	<u>1a/</u> <u>Aug. 8, 1949</u>			
	b. POWER								
	c. WATER SUPPLY								
	d. IRRIGATION	<u>2366.1</u>	<u>1861</u>	<u>34,105</u>	<u>40,070</u>	16. DATE NORMAL OPER. BEGAN			
	e. CONSERVATION								
	f. INACTIVE	<u>2335.0</u>	<u>489</u>	<u>5,965</u>	<u>5,965</u>	<u>Aug. 8, 1949</u>			
WATERSHED	17. LENGTH OF RESERVOIR <u>8.5 2/</u>			MILES			AV. WIDTH OF RESERVOIR <u>0.34</u>		
	18. TOTAL DRAINAGE AREA <u>656</u>			SQ. MI.			22. MEAN ANNUAL PRECIPITATION <u>21.9 (55)</u>		
	19. NET SEDIMENT CONTRIBUTING AREA <u>653</u>			SQ. MI.			23. MEAN ANNUAL RUNOFF <u>2.12</u>		
	20. LENGTH <u>47</u>			MILES			24. MEAN ANNUAL RUNOFF <u>74,218</u>		
	21. MAX. ELEV. <u>3100 ±</u>			MIN. ELEV. <u>2300</u>			25. CLIMATIC CLASSIFICATION <u>Subhumid</u>		
SURVEY DATA	26. DATE OF SURVEY	27. PERIOD YEARS	28. ACCL. YEARS	29. TYPE OF SURVEY	30. NO. OF RANGES OR CONTOUR INT.	31. SURFACE AREA ACRES	32. CAPACITY ACRE- FEET	33. C/W RATIO AC- FT. PER SQ. MI.	
	<u>Aug. 8, 1949</u>	<u>0</u>	<u>0</u>	<u>Contour</u>	<u>3/ 5 feet</u>	<u>3470</u>	<u>92,340</u>	<u>140.8</u>	
	<u>Oct. 4, 1951</u>	<u>2.16</u>	<u>2.16</u>	<u>Range (D)</u>	<u>34</u>	<u>3457</u>	<u>90,920</u>	<u>138.6</u>	
	34. DATE OF SURVEY	35. PERIOD ANNUAL PRECIPITATION	36. PERIOD WATER INFLOW ACRE- FEET			37. WATER INFL. TO DATE AC- FT.			
			a. MEAN ANNUAL	b. MAX. ANNUAL	c. PERIOD TOTAL	a. MEAN ANNUAL	b. TOTAL TO DATE		
	<u>Oct. 4, 1951</u>	<u>21.9</u>	<u>74,218</u>	<u>99,041</u>	<u>157,028</u>	<u>74,218</u>	<u>157,028</u>		
	38. DATE OF SURVEY	39. PERIOD SEDIMENT DEPOSITS ACRE- FEET			40. TOTAL SED. DEPOSITS TO DATE ACRE- FEET.				
		a. PERIOD TOTAL	b. AV. ANNUAL	c. PER SQ. MI.- YEAR	a. TOTAL TO DATE	b. AV. ANNUAL	c. PER SQ. MI.- YEAR		
	<u>Oct. 4, 1951</u>	<u>1370 2/</u>	<u>634</u>	<u>0.97</u>	<u>1370</u>	<u>634</u>	<u>0.97</u>		
	41. DATE OF SURVEY	42. AV. DRY WGT. LBS. PER CU. FT.	43. SED. DEP. TONS PER SQ. MI.- YR.		44. STORAGE LOSS PCT.		45. SED. INFLOW PPM		
	a. PERIOD	b. TOTAL TO DATE	a. AV. ANNUAL	b. TOT. TO DATE	a. PERIOD	b. TOT. TO DATE			
<u>Oct. 4, 1951</u>	<u>71.4</u>	<u>1508</u>	<u>1508</u>	<u>0.687</u>	<u>1.48</u>	<u>998</u>	<u>998</u>		

1/ Uncontrolled 13 ft. wide by 20.1 ft. deep orifice at crest elev. of 2366.1

2/ At normal water surface of 2366.1 1a/ Closure made at 9:00 A.M. on Aug. 8, 1949

3/ Original contours not considered sufficiently accurate for a reliable answer to the amount of deposited sediment

26.	DATE OF SURVEY	43. DEPTH DESIGNATION RANGE IN FEET ABOVE, AND BELOW, CREST ELEVATION														
		PERCENT OF TOTAL SEDIMENT LOCATED WITHIN DEPTH DESIGNATION														
Oct. 4, 1951	Impracticable due to discrepancies between this and the original survey.															
28.	DATE OF SURVEY	44. REACH DESIGNATION PERCENT OF TOTAL ORIGINAL LENGTH OF RESERVOIR														
		0-10	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100	-105	-110	-115	-120	-125
		PERCENT OF TOTAL SEDIMENT LOCATED WITHIN REACH DESIGNATION														
Oct. 4, 1951	Impracticable due to discrepancies between this and original survey.															
45.		RANGE IN RESERVOIR OPERATION														
WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW AC.-FT.	WATER YEAR	MAX. ELEV.	MIN. ELEV.	INFLOW AC.-FT.									
The initial filling was gradual over a period of 18 months. The reservoir has been kept practically full (2366.1) since the filling. Highest water level was 2372.35 on June 9, 1951.																
46.		ELEVATION-AREA-CAPACITY DATA														
ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY	ELEVATION	AREA	CAPACITY								
2386.2	3457	90,920	2340	684	8390											
2380	2915	71,280	2330	380	3108											
2370	2054	46,680	2320	132	532											
2366.1	1768	39,230	2309	0	0											
2360	1459	29,460														
2350	1046	16,940														
47. REMARKS AND REFERENCES																
<p>More than 90 percent of the soils in this area have developed on loess, a light-gray limy and floury silt.</p> <p>Report "Sedimentation Survey of Harry Strunk Lake by Bureau of Reclamation, September 1952," Water Supply Reports from Kansas River District, USBR, and USGS Water Supply Papers.</p>																
48. AGENCY SUPPLYING DATA					49. DATE											
Bureau of Reclamation					December 8, 1954											

EXHIBIT NO. 7



MEDICINE CREEK BASIN

SUBWATERSHEDS FOR LAND USE TABULATIONS

U. S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE

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